Quality Management Procedure
OETI-PMP-09

Environmental Protection Agency
Office of Enterprise Technology and Innovation (OETI)

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Document Change History

Version	Date	Author	Description of Changes

Contents

1. Introduction

This document defines the process by which the staff within the Environmental Protection Agency's (EPA's) Office of Enterprise Technology and Innovation (OETI) performs quality management for projects. This document incorporates industry best practices, EPA policies, and standards from the Project Management Institute (PMI) and the Software Engineering Institute's (SEI) Capability Maturity Model Integration (CMMI).

1.1 Purpose

This document defines the methodology, process flow, and relevant standards by which OETI project staff performs quality management activities and identifies participants and their responsibilities.

1.2 Background

Quality is defined as "the degree to which a set of inherent characteristics fulfill requirements."[1] Quality continues to be a top priority for senior executives in virtually all organizations and is consistently tied to stakeholder value and customer satisfaction. The intent of quality management is to reduce risk (cost and schedule) by building quality processes into the project to prevent an error from occurring rather than identifying an error or defect after the fact.

This procedure defines the approach for performing project quality management activities, including both process quality and product quality. Process quality can be applied to any project whereas product quality is typically more specific to an actual product or deliverable. In addition, quality assurance generally applies to the quality management of processes whereas quality control refers to the quality management of a product. However, the approach to developing a quality management process for either is the same. The Quality Manager is the individual responsible for quality activities and for developing the Quality Assurance Plan with input from the Project Manager, Project Team Leads, and stakeholders. The Quality Assurance Plan is defined during quality planning activities and can be formal or informal in its approach. It addresses the dimensions of quality applicable to the project.

The following are examples of quality dimensions:

- Time (e.g., samples evaluated over time yield results that consistently meet quality standards)
- Timeliness (e.g., stated deadlines are consistently met)
- Completeness (e.g., the project or resulting product addresses all stated requirements)
- Consistency (e.g., processes are defined and repeatable)
- Accessibility and convenience (e.g., product or service is available for use as stated in any requirements or service-level agreements [SLAs])
- Accuracy (e.g., random samples of output are consistent and correct)
- Responsiveness (e.g., stated response, customer service, or issue resolution times are consistently met or exceeded)

These dimensions can be evaluated using audits, review procedures, or quality metrics. The number and type of quality metrics that the Quality Manager collects and evaluates for the project is determined during the planning process. Metrics should correlate to any performance measures stated for the project. These measures can be defined by the quality standards to which the project is adhering and

[1] Project Management Institute Project Management Body of Knowledge (PMBOK®), Third Edition, 2004, Chapter 8.

other organizational requirements (e.g., internal SLA). In addition, metrics may be both internal and external in nature. Internal metrics are those that the Quality Manager uses to evaluate the project's adherence to stated quality goals and are often outputs of project processes (e.g., number of new issues identified and resolved per reporting period), while external metrics may be used to evaluate a third party or contractor's performance. If contractors are involved with the project, the Quality Manager may monitor the contractor to determine compliance with the required quality measures just as they audit and monitor the project staff. Additional detail is included in Appendix D of this procedure. External quality measures may be documented in such items as a Quality Assurance Surveillance Plan (QASP), an SLA, performance metrics in the contract, or the Quality Assurance Plan itself.

The quality management activities defined in the Quality Assurance Plan for systems projects follow the requirements of the Office of Environmental Information's (OEI) System Life Cycle Management (SLCM) Policy and procedures. The OETI quality management procedure adds to the agency's minimum requirements articulated in the SLCM Policy and procedures. The SLCM Policy applies only for system projects and not for non-system projects.

2. Approach

This section explains the approach used to develop the quality management procedure. It details the assumptions, the degree of scalability of the procedure, and the industry standards, best practices, and EPA current practices consulted in creating this procedure.

2.1 Assumptions

The following assumptions guide this quality management procedure:

- Quality management is a responsibility shared by project team members on OETI projects.
- A Quality Manager will be appointed by the Project Manager who has familiarity with quality management practices. Quality may or may not be the Quality Manager's only responsibility, depending on the size, scope, and complexity of the project.
- The Quality Manager will maintain documents using the document management procedures and tools defined for the project. (See *PMP-12 Document Management Procedure*.)
- The Quality Assurance Plan is a living document and its users continually update it over the life cycle of the project as new requirements, change requests, and re-planning activities occur.

2.2 Scalability

The Project Manager and the Quality Manager make the decision whether and to what extent to implement quality management at a high level during project planning. The timing of project planning activities is discussed in *PMP-02 Project Initiation and Planning Procedure*. Table 2-1 below provides basic guidelines for determining the extent to which this quality management procedure is implemented for a given project.

Table 2.1. Quality Management Procedure Scalability Guidelines

Procedure	Does the Procedure Apply?	Determining Procedure Scalability

OETI-PMP-09 Quality Management Procedure	Applies to all projects	▪ All projects require at least basic quality assurance practices such as peer review of a deliverable
		▪ Development of a formal Quality Assurance Plan is required for projects with a Project Complexity Model rating of "High" and for system projects
		▪ Quality assurance activities are performed for projects that incorporate performance based contracts (as dictated in the contract)
		▪ More detailed quality assurance practices are required if:
		  ▪ There are significant risks associated with the project that require quality assurance as a mitigating action
		  ▪ The quality of the product plays a significant role in the success of the project
		  ▪ The project must meet internal or external quality standards

The project team and Quality Manager define and tailor the quality management activities during the planning process based upon critical planning items such as complexity and risk, resource allocation and responsibilities, project budget and scope, duration of the project, and the number of organizations

that make up the project team. Smaller projects may require a simple quality review or a peer review of a deliverable at a designated project milestone. There may be no metrics or a smaller number of quality metrics to be collected, and fewer activities on the project schedule for quality management and process improvement activities. Large, complex projects typically require more extensive quality activities and metrics.

Quality scope is the extent of quality activities considered necessary for a project and is affected by the project purpose, the stakeholders, project duration, and risk. The higher the level of risk documented for a project, the greater the need for quality activities to mitigate the known and potential unknown risk(s). Projects involving new technologies or project types new to the organization are good candidates for quality management activities. Additional guidance on understanding risks and the management of risks is provided in *PMP-05 Risk Management Procedure.*

If a contractor is used to support the project, metrics may be established to evaluate the quality of the work performed or products delivered, in accordance with the contract. See both *PMP-10 Procurement Management Procedure* and Appendix D of this procedure for more information about evaluating contractor support activities.

The project team is responsible for evaluating all these factors to determine the type and extent of quality activities to implement for the project.

2.3 Best Practices

The OETI vision includes the employment of best practices from both industry and the EPA. This procedure incorporates the following best practices and existing regulations and policies:

- **EPA regulations and standards**
  - EPA Directive 2100.5, System Life Cycle Management Policy. Available at http://intranet.epa.gov/oei/imitpolicy/.
  - The EPA Interim Agency System Life Cycle Management Procedures. Available at: http://intranet.epa.gov/otop/policies/Extended_InterimProcedures.pdf.
  - Quality Assurance guidance for financial management can be found in the Quality Assurance Guide (2005_qa_guides.pdf) prepared by the Office of the Chief Financial Officer (OCFO). Available at: http://intranet.epa.gov/ocfo/policies/2006_qa_guides.pdf.
  - The EPA Quality Management and CMM information can be found in Section 12 of the EPA Interim Agency System Life Cycle Management Procedures. Available at http://intranet.epa.gov/otop/policies/Extended_InterimProcedures.pdf.
- **Federal regulations, industry standards and best practices**
  - International Standards Organization (ISO) ISO 9000, 9001. Available at: http://www.iso.org/iso/en/ISOOnline.frontpage.
  - Software Engineering Institute (SEI) Capability Maturity Model Integration (CMMI), CMMI for Systems Engineering, Software Engineering, Integrated Product and Process Development, and Supplier Sourcing, Version 1.1, CMMI-SE/SW/IPPD/SS, dated March 2002.
  - Project Management Institute Project Management Body of Knowledge (PMBOK®), Third Edition, 2004 (Chapter 8 – Project Quality Management).
  - Process Improvement in accordance with ANSI-ASQ Q9004:2000 (American National Standards Institute-American Society for Quality, Quality Management Systems – Guidelines for Performance Improvements).

- ANSI/ISO/ASQC Q10011-1-1991, Guidelines for Auditing Quality Systems – Part 1: Auditing.
- ISO/International Electrotechnical Commission (IEC). ISO/IEC 21827 Systems Security Engineering Capability Maturity Model (SSE-CMM).

3. Roles and Responsibilities

Table 3-1 presents the roles and responsibilities for OETI project staff involved in quality management activities. This table lists functions or tasks that each project role performs. While each role will be assigned to an individual staff member, an individual may perform multiple roles for a project.

Table 3.1. Quality Management Roles and Responsibilities

Role Definition	Responsibilities
Project Manager	▪ Provides guidance for the selection or definition of quality standards ▪ Assigns the role of Quality Manager to the individual who will be responsible for quality activities ▪ Participates in quality scope and planning process ▪ Ensures that the Quality Assurance Plan is consistent with the project scope statement and EPA standards ▪ Reviews and approves the Quality Assurance Plan ▪ Assigns action items resulting from quality management activities to the appropriate Project Team Lead ▪ Oversees implementation of quality process improvement action items ▪ Evaluates quality assurance results and assists with selection and prioritization of quality process improvement initiatives ▪ Creates or delegates the creation of Corrective Action Plans (CAPs) and evaluates CAPs for cost, schedule, and scope impacts
Planning and Evaluation Team Lead	▪ Participates in the quality management planning process ▪ Assists with evaluation of quality assurance reviews ▪ Reviews quality reports and metrics and participates in regular quality reporting meetings
Project Team Lead	▪ Participates in quality assurance and quality management planning process ▪ Assists with the development of the Quality Assurance Plan ▪ Participates in quality assurance reviews and assists with capture of quality metrics (as applicable) ▪ Oversees and assists with the implementation of team specific quality process improvement action items
Project Team Member	▪ Participates in quality management planning process ▪ Implements quality process improvement initiatives ▪ Participates in quality assurance reviews and assists with capture of quality metrics (as applicable)
Quality Manager	▪ Interprets EPA requirements for quality management programs ▪ Participates in quality management planning process and makes recommendations for an actionable Quality Assurance Plan specific to the project ▪ Develops the Quality Assurance Plan ▪ Ensures project participants receive appropriate quality training ▪ Oversees the execution of quality management activities and adherence to the quality standards ▪ Performs quality assurance audits/reviews and collects quality metrics, as appropriate ▪ Works with Team Leads to evaluate quality assurance results and makes recommendations for process improvements ▪ Determines whether process improvement initiatives have been implemented and evaluates impact on overall quality

4. Procedure

This section presents the process flow for quality management and describes each step of the process in detail.

4.1 Process Flow Diagram

Figure 4-1 depicts the process flow for the quality management procedure. This process originates with the definition of quality standards defined during project planning activities (see *PMP-02 Project Initiation and Planning Procedure*). The procedure may also be triggered by risk mitigation plans that impact existing or require new quality assurance activities. Finally, if contractor support is used, the contract terms and performance criteria are inputs to the quality management process. The procedure continues through quality planning, collection of quality metrics, evaluation, and implementation of necessary process improvements.

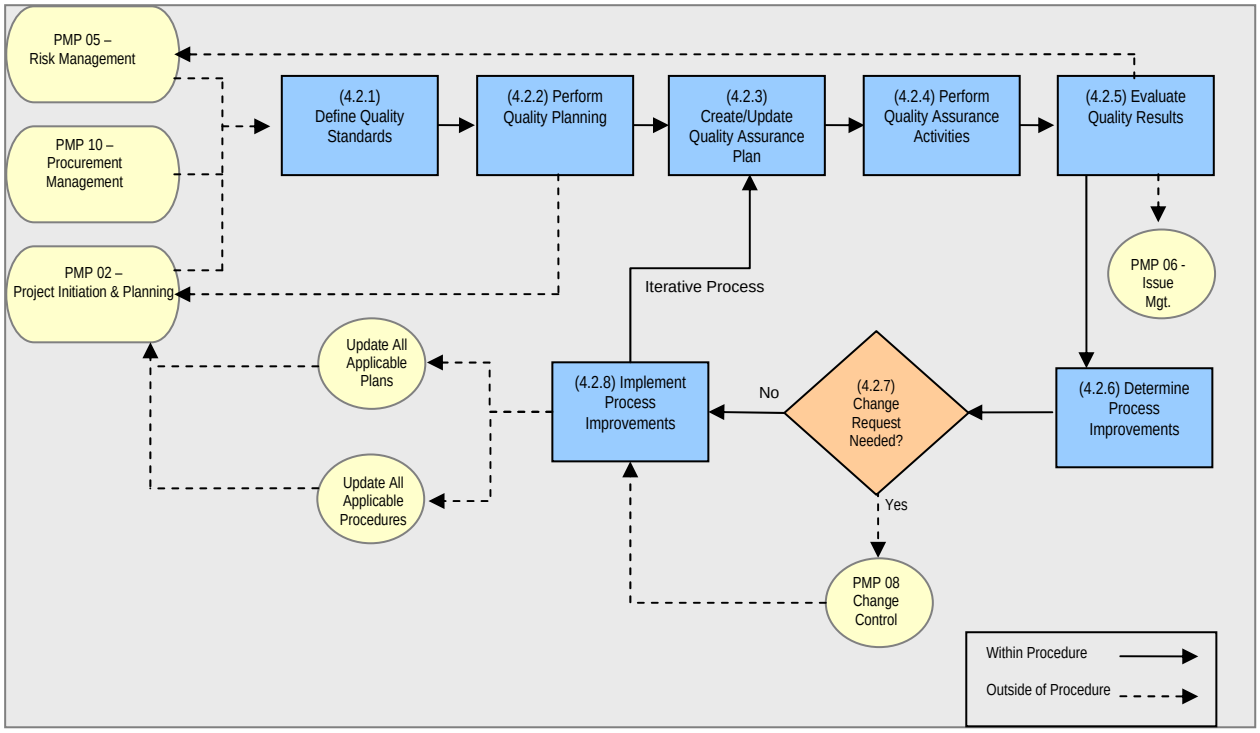

Figure 4-1. Quality Management Process Flow

4.2 Steps

The following sections describe the steps of the quality management process shown in Figure 4-1 and the roles involved with its execution.

4.2.1 Define Quality Standards

Early in the planning process, the Project Manager assigns the role of Quality Manager. The Project Manager and applicable Project Team Members work with the Quality Manager to determine the basis or standards for the Quality Assurance Plan. The standards could be organization- or industry-specific or a combination thereof. The quality standards are not typically developed specifically for the project unless there is a unique requirement to do so. The standards should be existing internal or external criteria that can be used to determine the types of quality activities that are required or desirable. The standards selected also provide the basis for the planning sessions and the basic quality goals and

provide some context for quality scope discussions. The Quality Manager documents the selected standards in the Quality Assurance Plan. Standards are more applicable for large projects. Smaller projects may not require selected standards.

4.2.2 Perform Quality Planning

The Project Manager, the Project Team Lead, and Project Team Members work with the Quality Manager to determine the details of the quality management activities. The scope of quality management activities varies by project but includes all quality assurance processes that the project team will perform over the life of the project. The Project Manager and Quality Manager ensure that the scope of the process is consistent with the project scope statement and determine which aspects of quality management apply to their project. Often, the activities selected depend on the type of project and the scope, risk, and complexity of the project. Activities are also selected based on what aspect of quality needs to be managed (product, process, or output such as a deliverable). These aspects may include:

- Quality goals and objectives for the project
- Timeframe and frequency for quality activities (weekly, monthly, quarterly)
- Resource allocation (internal versus external)
- Roles and responsibilities related to quality activities for project resources
- Quality training required for project resources
- Budget allocated for quality activities
- Type of quality assurance audits and reviews (process and/or product) depending on the nature of the project
- Quality metrics to be collected
- Quality reporting frequency and method
- Issue escalation process for quality issues (should adhere to the process defined through *PMP-06 Issue Management*)
- Communication of quality objectives, activities, and results
- Schedule implications of quality activities
- Whether or not an Independent Verification and Validation (IV&V) is required for the project. (Note: The decision to conduct an IV&V for a project may be determined anytime during the project lifecycle and usually initiates a separate project track based on the need for procurement or identification of an independent evaluator). Refer to *PMP-10 Procurement Management Procedure* for procurement guidance and *PMP-02 Project Initiation and Planning Procedure* for guidance on initiating new projects.

The outputs from the quality management planning process may have schedule or cost considerations and may need to be evaluated for feasibility prior to finalizing the details of the Quality Assurance Plan. Refer to *PMP-02 Project Initiation and Planning Procedure* for guidelines for estimating the costs and resources for quality activities and to *PMP-03 Project Schedule and Cost Baseline Procedure* for guidelines on incorporating these activities into the schedule and cost baselines for the project.

4.2.3 Create/Update Quality Assurance Plan

The Quality Manager creates the Quality Assurance Plan as part of the Project Management Plan. For system projects, the Quality Assurance Plan is developed in accordance with OEI's SLCM policy and

procedures and is incorporated in the System Management Plan (SMP), a document similar to the Project Management Plan. The Quality Assurance Plan should address how the project will implement and monitor the quality activities defined in the quality management planning process. In addition, the Quality Assurance Plan defines what quality activities will be measured for the project and reflects all decisions made during the quality management planning process. The plan captures the specific metrics that will be collected and analyzed to evaluate the quality processes. The Project Manager reviews and approves the Quality Assurance Plan prior to its issuance to the Project Team Members participating in quality activities.

The Quality Assurance Plan is a living document and its users update it periodically to reflect changes in scope or approach. The plan should address the elements defined in the Checklist for Quality Management in Appendix B. Links to resources and sample Quality Assurance Plans can be found in Appendix C. A sample Quality Assurance Plan framework is provided in Appendix E. The Project Manager should review and approve the Quality Assurance Plan each time it is updated.

4.2.4 Perform Quality Assurance Activities

The Quality Manager works with the Project Team Lead and Project Team Members to perform quality assurance activities that are appropriate for the project as defined in the Quality Assurance Plan. The Quality Manager objectively evaluates adherence to process descriptions, standards, and procedures determined to be applicable for the project in the Quality Assurance Plan and reports findings accordingly. Additionally, the Quality Manager ensures that quality training is delivered to project resources as required. Detailed descriptions of the types of quality assurance activities that may be selected and implemented for a project are included in Appendix F.

4.2.5 Evaluate Quality Results

The Quality Manager works with the Project Team Lead(s) for the process/product being evaluated to document the appropriate results from the quality assurance activities. He or she evaluates the results in relation to the stated quality assurance and/or quality control goals or standards. Reporting the results of the quality assurance activities is part of this step. The Quality Manager defines the content and format for the Quality Reports based on the quality assurance activities employed. Reporting activities ensure that the proper information is communicated to the appropriate level of management.

Evaluation activities determine whether the quality assurance findings and metrics provide evidence of process or product issues. Issues may include an increase in the number of errors or reported incidents or metrics that exceed defined thresholds for a process or product. Issues are communicated and tracked in accordance with *PMP-06 Issue Management Procedure*. Project Team Members may also look at findings over time to determine if processes are improving or becoming less efficient and log risks for potential problems. Risk identification, mitigation, and tracking are described in *PMP-05 Risk Management Procedure*. The Quality Manager, Project Manager, and Project Team Leads may attempt to identify process improvements or other mitigating actions in an effort to prevent quality issues.

4.2.6 Determine Process Improvements

The results of the quality assurance reviews together with the quality metrics are used by the Quality Manager to determine whether process improvement initiatives are needed. The criteria used to make this decision can vary but usually include the severity of any quality issues identified, potential impact on cost, schedule and project risk, and whether identified problems can be tied to a specific event (e.g., resource turnover) or seem to point to a process that is “broken” or not working effectively. The scope of the initiatives can be as simple as an action item or as involved as a separate project for building additional quality into existing processes or for adding new processes. Process improvement

recommendations can apply to any process. Typically, a CAP is created by the Project Manager (or delegated to the appropriate project team member) to define the specific steps the project team will take to address the issues identified during the quality audits and/or reviews. The Project Manager should evaluate CAPs to consider the impact on cost, schedule, scope and overall quality.

4.2.7 Change Request Needed?

The Quality Manager works with the Project Manager to evaluate the proposed process improvement(s) to determine which improvements require routing through the Change Control Process defined in *PMP-08 Change Control Procedure*. For those with measurable cost, schedule, or resource requirements for implementation, the Project Manager or designated Project Team Lead completes a change request (CR) for review and approval.

4.2.8 Implement Process Improvements

The Quality Manager communicates the process improvement recommendations and action items to the Project Team Members during the project statusing activities that are defined for the project. Approved process improvement activities and/or CAP(s) should be reflected in the Project Management Plan, Quality Assurance Plan, and any applicable subsidiary plans. Guidance for developing and updating the Project Management Plan and defining statusing activities can be found in *PMP-02 Project Initiation and Planning Procedure* and *PMP-04 Project Status, Reporting, and Forecasting Procedure*.

The Project Manager or a designated team member determines the level of effort required for each approved recommendation/action item. If the resources of the project team are constrained, prioritization of process improvement initiatives may be required. The team decides how the recommendations and action items will be implemented and assigns the activities to the appropriate resources. The Quality Manager will evaluate the effectiveness and impact of the new measures in subsequent quality assurance reviews in accordance with the Quality Assurance Plan.

5. Considerations

The following provides a list of general best practices that should be considered when conducting quality management:

- The Quality Manager should be experienced in implementing and maintaining quality management activities and also be familiar with EPA and industry standards. In addition, the Quality Manager should be as autonomous as possible and not report directly to the Project Manager but rather to the Project Sponsor. For large and/or technically complex projects, the quality assurance role is usually performed by an external party or contractor.
- Most projects, regardless of size, benefit from some type of quality assurance activity, even if it is as simple as a peer review of the final product before submission.
- Schedules and work plans should incorporate quality activities and dependencies should be noted as soon as the Quality Assurance Planning process is complete. As a result of quality assurance activities, changes to work plans and schedules may be required to take into account any new process improvement activities and/or requirements. The status of quality assurance activities should be updated and reported to the project team at regular intervals.
- The greater the number and severity of risks on the project, the greater the need for a quality management program. Quality assurance and risk management activities should be integrated. Quality assurance processes can identify project risks. Through the risk management process the project team determines the risk response, which may include additional, more detailed or more frequent quality assurance activities.
- The quality management process should be in effect for the duration of the project.

Appendix A Acronyms

Abbreviation	Description
ANSI	American National Standards Institute
ASQ	American Society for Quality
CAP	Corrective Action Plan
CMMI	Capability Maturity Model Integration
CR	Change Request
EPA	Environmental Protection Agency
IEC	International Electrotechnical Commission
IMS	Integrated Master Schedule
IRM	Information Resources Management
ISO	International Standards Organization
IV&V	Independent Verification and Validation
OCFO	Office of the Chief Financial Officer
OEI	Office of Environmental Information
OETI	Office of Enterprise Technology and Innovation
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PMO	Project Management Office
QASP	Quality Assurance Surveillance Plan
SEI	Software Engineering Institute
SLA	Service Level Agreement
SLCM	System Life Cycle Management
SMP	System Management Plan
SSE-CMM	Systems Security Engineering Capability Maturity Model

Appendix B Checklist for Quality Management

The following provides a checklist for the key activities associated with each step of this quality management procedure.

Activities	Responsible Parties
4.2.1 Define Quality Standards	
❑ The role of Quality Manager is assigned	Project Manager
❑ External quality requirements for the project are reviewed ❑ The quality standards for the project are defined ❑ Implications of the quality standards on the type of quality assurance activities that should be implemented for the project are reviewed	Quality Manager/Project Manager
4.2.2 Perform Quality Planning	
❑ Roles and responsibilities for quality assurance activities are defined ❑ A schedule for quality assurance activities is defined ❑ Quality assurance activities are defined for the project based on project size, scope and complexity, and defined quality standards ❑ Quality metrics are defined specifically for the project ❑ A process for capturing and documenting quality metrics are defined ❑ Communication activities for providing quality assurance feedback and guidance within the project and across the organization are defined ❑ Reporting mechanisms for quality assurance activities are defined ❑ A process for creating and implementing Corrective Action Plans (CAPs) is defined ❑ A process for escalating and resolving quality issues is defined	Quality Manager/Project Manager/Project Team Lead/Project Team Members
❑ Quality training requirements for team members are defined	Quality Manager
❑ Quality assurance activities are incorporated into the project schedule	Quality Manager/Project Manager
4.2.3 Create/Update Quality Assurance Plan	
❑ Decisions made during quality planning are documented and incorporated in the Quality Assurance Plan ❑ The Quality Assurance Plan is communicated to Project Team Leads and project team members (if applicable)	Quality Manager
❑ The Quality Assurance Plan is consistent with all other project plans in terms of scope and approach ❑ The Quality Assurance Plan is completed, reviewed, and approved by project management	Quality Manager/Project Manager
4.2.4 Perform Quality Assurance Activities	
❑ Quality training is has been delivered to project resources as required	Project Team Leads
❑ Quality Assurance activities are conducted as defined in Quality Assurance Plan and at the intervals and/or scheduled dates defined in the project schedule ❑ The results of the quality assurance activities are documented as defined in the	Quality Manager

Activities	Responsible Parties
Quality Assurance Plan	
4.2.5 Evaluate Quality Results	
❑ Report formats are defined ❑ Quality Assurance results are communicated to the appropriate Project Team Leads or team members	Quality Manager
❑ Quality Assurance results are reviewed as defined in Quality Assurance Plan and at the intervals and/or scheduled dates defined in the project schedule	Quality Manager/Project Manager
❑ Evidence of quality issues is analyzed to determine impact and scope of the problem(s)	Quality Manager/Project Manager/Project Team Leads
4.2.6 Determine Process Improvements	
❑ Quality results are reviewed by appropriate team members and necessary process improvement options are evaluated ❑ Process improvement recommendations are reviewed and prioritized as needed	Quality Manager/Project Manager/Project Team Leads
❑ Corrective Action Plans (CAP)s are developed for implementation of process improvements	Project Manager
❑ Impact (cost, schedule, resources) of each process improvement is analyzed and documented	Quality Manager
4.2.7 Change Request Needed?	
❑ The proposed process improvement is submitted as a change request if there are measurable cost, schedule and resource impacts ❑ Process improvements not requiring measurable cost, schedule, or resources change are scheduled for implementation	Quality Manager
4.2.8 Implement Process Improvements	
❑ Process improvements not requiring measurable cost, change, and resources are implemented by working with appropriate Project Team Leads and/or team members	Quality Manager/Project Manager/Project Team Leads
❑ Approved change requests for process improvements are planned and scheduled for implementation ❑ The Project Management Plan, Quality Assurance Plan, and any other impacted subsidiary plans are updated to reflect the changes resulting from implementation of process improvement(s) ❑ Implemented process improvement actions are measured and evaluated over time to determine success of the improvement(s)	Quality Manager/Project Manager

Appendix C Additional Resources

The links below provide additional background, guidance and examples for the development of a quality plan and quality checklist for the project:

	Form/Guidance	Source	Website
1.	Guidance for non-software Quality Assurance	State of New Jersey	http://www.state.nj.us/transportation/eng/documents/miscref/qaplanguide.shtm
2.	Guidance for Software Quality Assurance and Plan Template	Washington State Department of Information Services NASA Goddard Space Flight Center NASA Marshall Space Flight Center Tantara Inc. (private sector company offering advice for software process improvement and software quality assurance)	http://isb.wa.gov/tools/pmframework/planning/qualityassurance.aspx http://sw-assurance.gsfc.nasa.gov/disciplines/quality/index.php http://www.cio.energy.gov/documents/csr_sqa_plan.doc http://www.tantara.ab.ca/ja_qaiee.htm
3.	Sample Quality Assurance Checklists	Department of Energy State of Texas	http://cio.energy.gov/it-project-management/510.htm http://www.dir.state.tx.us/eod/qa/monitor/qa.htm
4	ISO Quality Standards, Section ISO 9000-14000, Understand the Basics, ISO 9000:2000 Selection and Use	International Standards Organization	http://www.iso.org
5	CMMI for Development Version 1.2, Process and Product Quality Assurance, page 353	Software Engineering Institute	http://www.sei.cmu.edu/

Appendix D Interface Requirements

The purpose of this appendix is to provide general guidelines for collecting the appropriate information from contractors to ensure seamless integration of project quality data and promote efficient monitoring of the overall project. Frequently, data is needed by support contractors to enable the Project Manager to assess real-time status accurately against overall performance, schedule, and cost objectives. In addition, defined interface points ensure that both the government and contractor understand their specific roles and responsibilities in quality management and reporting and that the information can be efficiently captured utilizing the project's established management processes and tools. As a result, the data, reporting, and interface requirements need to be well defined early in the process in order to ensure that they are fully described in the awarded contract. For quality management, these requirements may include a Quality Assurance Surveillance Plan (QASP), Service Level Agreements (SLAs), performance metrics in the contract, or the Quality Assurance Plan itself.

The following series of questions is provided to help determine the quality interface requirements appropriate for a specific project. Requirements may vary significantly depending on the scope, complexity, size, duration of the project and type of contracts awarded. Overall, the questions are designed to help refine what kind of information will be needed to ensure effective quality management of the project and the correlating responsibilities of the contractor.

- Does the contractor have explicit quality standards or requirements stated in the contract?
  - Will the contractor be responsible for providing the metrics or data on which it will be evaluated?
  - What format is required for submission of quality data?
  - How often must the data be submitted?
  - Who from the project team is responsible for assisting with the evaluation of the data?
  - Is anyone from the project team responsible for analyzing contractor deliverables to determine if they meet specified requirements?
  - Are the implications of bad data or unacceptable metrics clearly stated in the contract?
- What data are needed for EPA to access contractor performance in the manner described by the QASP? How and when should this data be submitted?
- Will the contractor be required to identify and track risks and issues and provide updates to EPA? If so, in what format and at what frequency?
- Will the contractor be required to report errors for certain activities (such as software development) and provide updates to EPA? If so, in what format and at what frequency?
- Will quality activities performed by the contractor be reflected in the Integrated Master Schedule (IMS)?
- Will the contractor be responsible for participating in quality assurance activities? If so, are its responsibilities clearly defined in the contract or task order?
- Is the contractor required to meet certain quality standards for project processes? If so, how will adherence be evaluated?

Appendix E Quality Assurance Plan Template

This appendix provides a sample Quality Assurance Plan template that may be used and/or tailored as appropriate according to project needs. Appendix C provides internet links to other examples of quality assurance plans and templates.

Quality Assurance Plan Template

Acceptance / Approval Page

DOCUMENT CHANGE HISTORY – *Complete the version, date, author and description column to accurately describe the modifications made to this document.*

Version	Date	Author	Description of Changes
V X.X			

1.0 INTRODUCTION

1.1 PURPOSE

[This section defines the purpose of the plan. Example: The Quality Assurance Plan defines the guidelines and procedures for managing, executing, tracking and reporting the quality assurance activities for the <project name> project.]

1.2 SCOPE

[This section defines the parameters of the quality assurance plan. Add any text necessary to define what is included and what is excluded as part of the scope of the plan. This text may:

- Name the specific entity, product, project team, and/ or component for which quality assurance activities are performed and those that are expressly excluded
- Define whether the plan addresses quality assurance/control activities for processes and/or products
- Identify if contractor support is used on the project and if they will be the subject of quality assurance activities
- Describe other boundaries for the plan]

1.3 REFERENCE DOCUMENTATION

[This section identifies the references, standards, procedures and other documents used to develop the QA activities for the project. This list may include:

- <project name> Project Management Plan
- <project name> Project Schedule
- <project name> Configuration Management Plan
- <project name> Configuration Item/Configuration Data List
- <project name> Risk Management Plan
- <project name> Statement of Work and/or Contract and/or Applicable Contractual Requirements
- Other project documentation, as necessary]

- Internal or external quality management resources or standards, as applicable. For system projects, the Quality Manager should refer to the Office of Environmental Information's System Life Cycle Management Policy and corresponding procedures when developing the quality assurance plan.

1.4 PLAN MAINTENANCE

[This section identifies the office or group responsible for developing, maintaining, and distributing this plan. It also establishes how often the plan is reviewed, typically by organizational directives. Updates are prepared as required.]

2.0 QUALITY GOALS AND OBJECTIVES

[This section identifies the goals and objectives of the QA plan followed by a brief sentence explaining how they are achieved.]

3.0 ROLES AND RESPONSIBILITIES

[This section provides a description of the roles and responsibilities for key participants involved in implementing the QA plan. It also provides the hierarchy of roles within EPA.]

4.0 QUALITY ASSURANCE ACTIVITIES

4.1 QUALITY ASSURANCE RESOURCES

[Describe the composition of the resources that support the project's quality assurance activities. All quality assurance-related costs should be planned, monitored and controlled in accordance with PMP-02 Project Initiation and Planning Procedure, PMP-03 Project Schedule and Cost Baselining, and PMP-04 Project Status, Forecasting and Reporting.]

4.2 PROGRAM ACTIVITIES

[This section describes the quality assurance activities for the project, how often they occur, and the procedures that apply to them. The information may be presented in narrative or table format. The Quality Manager recommends the type of activities needed to objectively evaluate both process and product quality. Quality activities may include:

- Audits - The Quality Manager is primarily responsible for conducting product and process audits with the support and assistance of project team members and contractors as appropriate. The purpose of audits is to identify deviations in process performance or work products, identify noncompliance items that cannot be resolved at the technical support or project management level, validate process improvement/corrective action achievements, and provide relevant reports to all management levels.
- Process Audits - The Quality Manager conducts process audits in accordance with the audit process documented in PMP-09 Quality Management Procedure. Process audits occur throughout the life of the project and are planned and documented in the project schedule. The Quality Manager typically has the option of conducting *ad hoc* process audits as deemed necessary.
- Product Audits - A product audit is an independent examination of a deliverable and/or work product(s) to assess compliance with specifications, standards, client requirements, or other

criteria. Product audits occur throughout the life of the project and are planned and documented in the project schedule.

- Reviews - The Quality Manager participates, observes, and/or conducts reviews, in accordance with the process documented in *PMP-09 Quality Management Procedure*. Additionally, the Quality Manager conducts independent reviews of the project's process adherence and product standards. These reviews are usually *ad hoc* and coordinated with the Project Manager.

Example:

The project's Quality Manager performs the activities in Table 1 below in support of the quality goals and objectives in Section 2. The activities in Table 1 are not one-time events, but occur regularly, periodically, or on an ad hoc *basis. The Quality Manager and the Project Manager make the appropriate determinations about the frequency of the activities and reflects those decisions in the project QA Schedule. For each activity that is repeated, the focus may be adjusted to specific areas of concern to ensure that all aspects of the quality objectives are addressed.*

Procedures for performing the following activities are reflected in the right hand column of the table and are explained in the corresponding procedure. For example, quality assurance activities as determined by the Quality Manager and the Project Manager are documented in the project's schedule in accordance with guidance provided in PMP-03 Project Schedule and Cost Baseline Procedure*. This schedule should be reviewed and updated as appropriate within the life cycle of the project and statused as described in* PMP-04 Project Status, Reporting, and Forecasting Procedure*.]*

Table 1. QA Program Activities

QA Activity	Applicable QA Procedures
QA Planning—Quality Manager performs the appropriate planning for all QA activities and reflects the results in the QA Plan and Schedule. The QA Schedule is reviewed at least monthly and updated as appropriate. The plan is reviewed at least annually and updated as appropriate.	QA Planning
QA/QM Plan Reviews—Quality Manager reviews the QA/QM plans developed by contractors. Comments are provided on non-compliance issues. The Quality Manager approves the plans when corrections are made based on the comments provided.	QA Product Review QA Document Management QA Status Reporting
Attend Selected Reviews—Quality Manager attends selected reviews (contractor status meetings, Integrated Baseline Reviews, Integrated Program Reviews, and other executive reviews) to evaluate from a QA perspective the program/project objectives, activities, and issues.	QA Document Management QA Status Reporting

4.3 REPORTING

[This section establishes the reporting channels for quality assurance. It describes the requisite report format(s) to include the scope of the audit/review, findings, and quality improvement recommendations. This section also defines how findings are tracked and reported as well as any tools that are used in the quality assurance process. The project's Quality Manager is responsible for monitoring, tracking, and updating the status of findings through closure. Formal reporting of quality assurance activities and findings should be performed in accordance with PMP-04 Project Status, Forecasting and Reporting Procedure*.]*

4.4 ESCALATION (If applicable)

[This section defines the escalation procedure for issues not resolvable by the Project Manager and the Quality Manager. Reference PMP-06 Issue Management Procedure *for specific guidance on identifying and tracking issues.]*

5.0 QUALITY ASSURANCE METRICS (if applicable)

[This section describes the use of measurement and analytic techniques to determine the effectiveness of quality assurance activities. The number of metrics defined is proportional to the size, complexity, risk, and duration of the project. Example:

Metrics are a means of tracking and reporting on the progress of quality assurance program. Measurements are data collected while conducting quality assurance activities. These data can be analyzed to derive indicators (metrics), which can be depicted in charts, graphs, and plots to support the following:

- Determination of QA process/program status.
- Identification of trends.
- Identification of process and product deficiencies.
- Identification of process improvement opportunities.

Define the measurements that will be collected during quality assurance activities:

- Number of full and partial audits planned for a period of time.
- Number of full audits, partial audits, and monitoring activities conducted:
  - By month
  - By year
- Number of CAPs opened from audits and monitoring.
- Number of CAPs closed over a period of time.
- Number of CAPs that missed their due date.

The Quality Manager's analysis is conducted with the Project Manager to determine trends and support continuous process improvement.]

6.0 CONSTRAINTS AND RISKS

6.1 CONSTRAINTS

[This section defines the constraints associated with the quality assurance plan. Example:

Project quality assurance activities are limited by the number of staff assigned, including contractor. This is often due to availability of funding for QA and the procedural and timeframe restrictions of the budget process.]

6.2 RISKS

[This section describes the risks and mitigation strategies for those risks associated with the quality assurance plan. Example:

The consequences of not having enough staff to maintain the operation will jeopardize the Project Management Office (PMO)'s ability to mature into an effective organization, and will adversely affect the PMO's credibility with Congress, the public, and other stakeholders. To mitigate this risk, the PMO

should continue to implement its quality assurance activities in a phased approach using management input and risk-based prioritization as the basis for identifying the processes on which quality assurance is to be performed. In addition, funding should be provided to increase the quality assurance resources to a level that will support workload effectiveness. Ultimately, a QA staff equivalent to three to five percent of total project staff (industry standard) should be the target for having a viable QA function.]

APPENDIX A - **ACRONYMS**

APPENDIX B - **DEFINITIONS**

Appendix F Quality Assurance Techniques

The types of quality assurance activities are defined as follows:

Product/service and process audits – The purpose of audits is to identify deviations in process performance, identify findings, escalate findings that cannot be resolved at the technical support or project management level, validate process improvement/corrective action achievements, and provide relevant reports to all management levels. The audit process is essentially the same for either a process or product audit.

- Process audits ensure compliance with the applicable organizational and project plans, processes, and standards. Process audits occur throughout the life of the project and are identified in the project schedule. Unscheduled process audits may also be conducted as deemed necessary by the Quality Manager or Project Manager.
- A product audit is an independent examination of a deliverable and/or work product(s) to assess compliance with specifications, standards, customer/stakeholder requirements, or other criteria, preferably conducted prior to delivery to the customer/stakeholder. Product audits occur as products are being developed, prior to delivery, and/or at project milestones. The Quality Manager identifies, documents, and tracks deviations/non-compliances to closure. Product audits are conducted in accordance with the applicable audit processes and checklists as tailored for the projects and are also identified in the project schedule.

The Quality Manager performs the following activities (as appropriate) when conducting either audit:

- Define the scope and purpose of the audit within the audit notification
- Prepare for the audit. (Preparation activities can include preparing audit procedures, checklists, and questionnaire)
- Conduct preparation meetings in advance of the audit and/or send notification of pending audit:
  - Define areas to be reviewed
  - Define review criteria
- Examine evidence of implementation and controls
- Interview personnel to learn the status and functions of the processes and the status of the products (when applicable)
- Identify findings
- Discuss findings with the individual(s) being audited
- Prepare and submit an audit report to Project Manager and individual(s) responsible for the process or product being audited
- Refer unresolved findings to individual(s) responsible for the process or product audited and to the Project Manager
- Follow up on corrective action/process improvement.

An audit is considered complete when:

- Each element within the scope of the audit has been examined
- Findings have been presented to the audited organization
- Response to findings have been received and evaluated

- Audit findings and recommendations are documented (Audit Report) when the Project Team has developed and submitted an approved CAP.

Quality Reviews - Reviews allow the evaluation of documentation (processes, procedures, and artifacts) and other activities in a less rigorous manner than audits. They allow the Quality Manager to observe and identify problems, issues, and areas in need of improvement with a minimum of impact on the operational aspects of a project. Reviews seek to identify problems and issues early, and help simplify the monitoring and management of problem areas throughout the project. The Quality Manager may also conduct independent reviews of the project's process adherence and product standards. While the results may indicate findings like an audit, the process is different.

A typical review includes the following steps:

- Coordinate review with Project Manager, as these are normally conducted on an *ad hoc* basis
- Verify that correct review procedures are in place
- Document review results against quality factors (correctness, timeliness, reliability, productivity, consistency)
- Verify product/service traceability, if applicable
- Verify product/service against contractual requirements, if applicable
- Verify product/service against standards and procedures, if applicable
- Validate process adherence as necessary
- Document review results/findings against product validation/process verification information
- Report results to affected groups and Project Manager
- Review CAPs as appropriate.